

LOWER ARKANSAS RIVER BASIN TOTAL MAXIMUM DAILY LOAD

Waterbody: Pawnee and Buckner Creek
Water Quality Impairment: Fecal Coliform Bacteria

1. INTRODUCTION AND PROBLEM IDENTIFICATION

Subbasin: Pawnee and Buckner Creek

Counties: Hodgeman, Finney, Ford, Gray,
Scott, Lane, Ness and Pawnee

[illegible]

HUC 8: 11030005:
HUC 11 (HUC 14):
010 (010, 020, 030, 040, 050)
020 (010, 020, 030, 040, 050)
030 (010, 020, 030, 040, 050, 060, 070)
040 (010, 020, 030, 040, 050, 060, 070, 080, 090, 100)
050 (010, 020, 030, 040)

Drainage Area: 2,252.5 mi²

Main Stem Segments: 3 on the Pawnee River starting at the confluence with Buckner Creek and extending upstream to confluence of Hackberry Creek. Segments 1 and 2 on Buckner Creek starting at the confluence with Pawnee River and extending upstream to headwaters in Northcentral Gray County (**Figure 1**).

Tributary Segments: Sand Creek (11)
Rock Creek (9)
Sawlog Creek (3)

Designated Uses: Expected Aquatic Life Support; Secondary Contact Recreation; Domestic Water Supply; Food Procurement; Groundwater Recharge; Industrial Water Supply Use; Irrigation Use; Livestock Watering Use for Main Stem Segment on Pawnee River (3); Expected Aquatic Life Support, Secondary Contact Recreation, Food Procurement; and Groundwater Recharge for Main Stem Segments on Buckner Creek (1 and 2); Expected Aquatic Life Support and Secondary Contact Recreation Tributary Segments (3, 9 and 11).

1998 303(d) Listing: Table 1 - Predominant Non-point Source Impacts

Impaired Use: Secondary Contact Recreation on listed segments

Water Quality Standard: Fecal Coliform Bacteria: 2000 colonies per 100 ml for Secondary (KAR 28-16-28e(c)(7)(C)).

2. CURRENT WATER QUALITY CONDITION AND DESIRED ENDPOINT

Level of Support for Designated Use under 1998 303(d): Partially Supporting Secondary Contact Recreation

Monitoring Sites: Station 586 near Burdett (**Figure 1**).

Period of Record Used: 1990 to 1999

Flow Record: Pawnee River near Larned (07141200)

Long Term Flow Conditions: 10% Exceedence Flow = 38 cfs, 7Q10 = 1 cfs

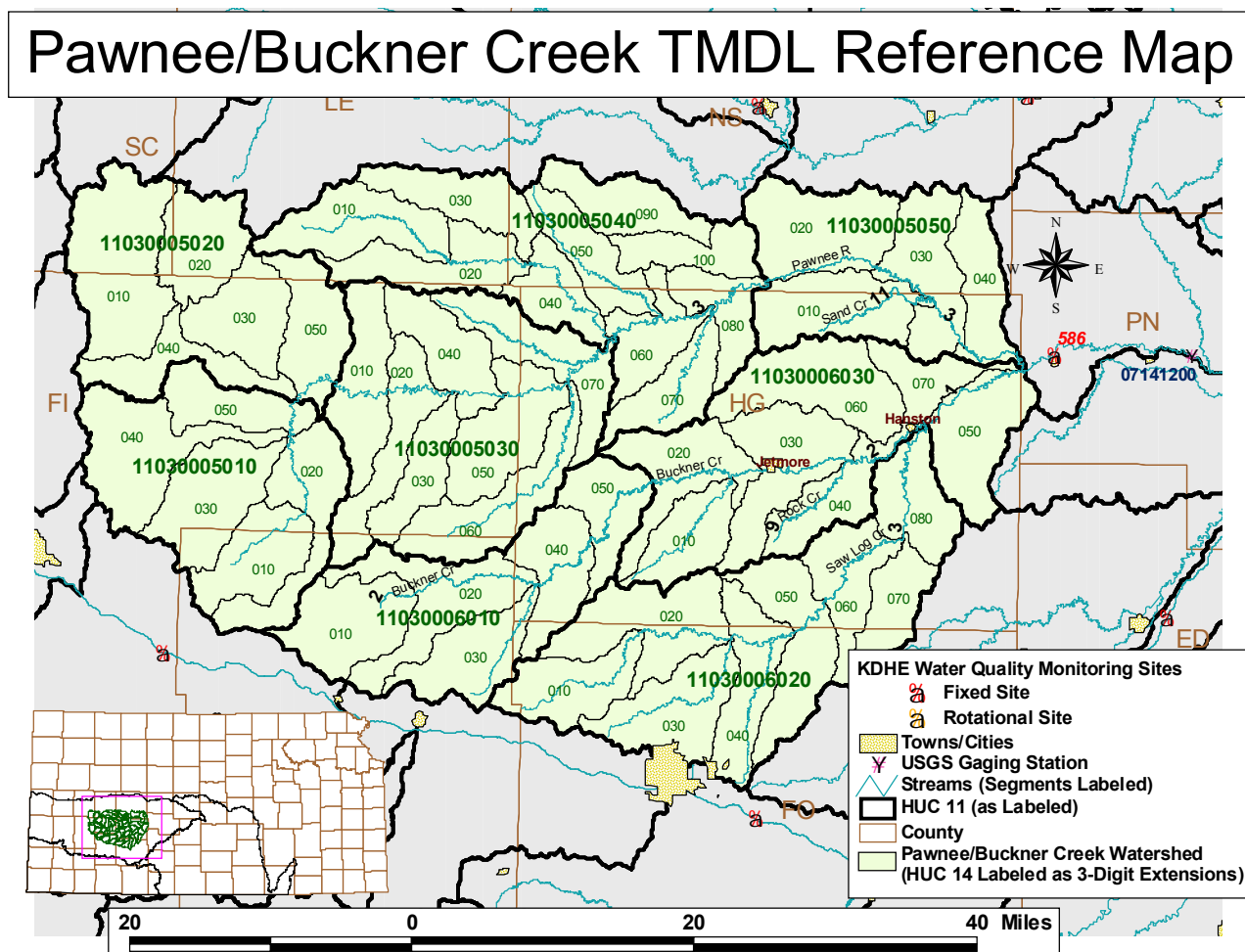


Figure 1

Current Conditions: Since loading capacity varies as a function of the flow present in the stream, this TMDL represents a continuum of desired loads over all flow conditions, rather than fixed at a single value. Flow duration data were determined from the Rozel Gage Station for each of the three defined seasons: Spring (Mar-Jul), Summer-Fall (Aug-Oct) and Winter (Nov-Feb). High flows and runoff equate to lower flow durations, baseflow and point source influences generally occur in the 75-99% range. Load curves were established for Secondary Contact Recreation criterion by multiplying the flow values along the curve by the applicable water quality criterion and converting the units to derive a load duration curve of colonies of bacteria per day. These load curves represent the TMDL since any point along the curve represents water quality at the standard at that flow. Historic excursions from WQS are seen as plotted points above the load curves. Water quality standards are met for those points plotting below the applicable load duration curves (**Figures 2, 3 and 4**).

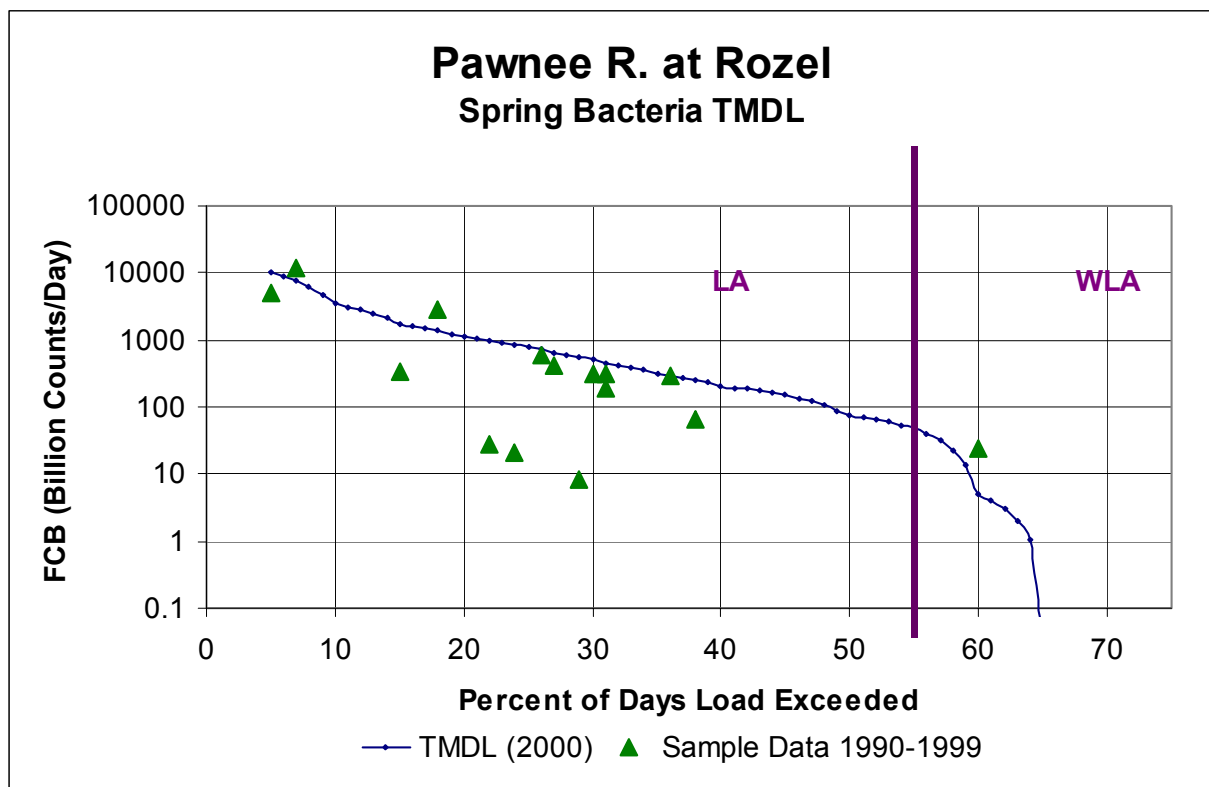


Figure 2

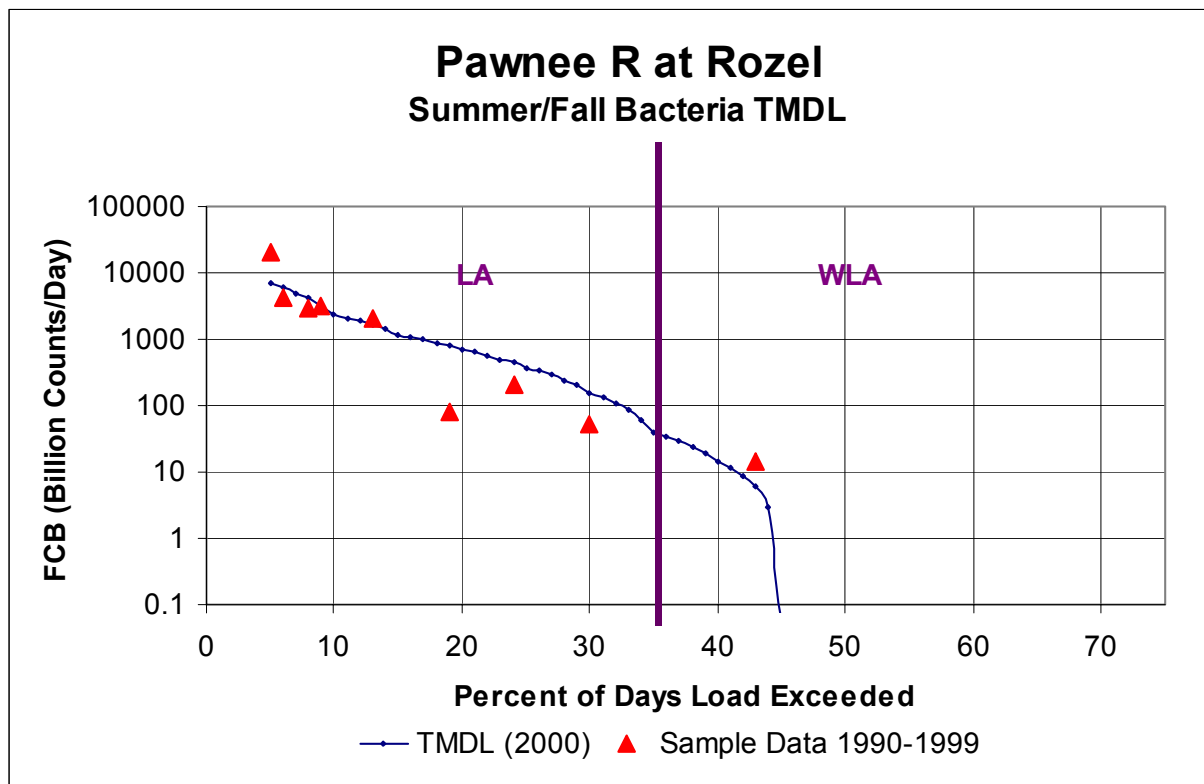


Figure 3

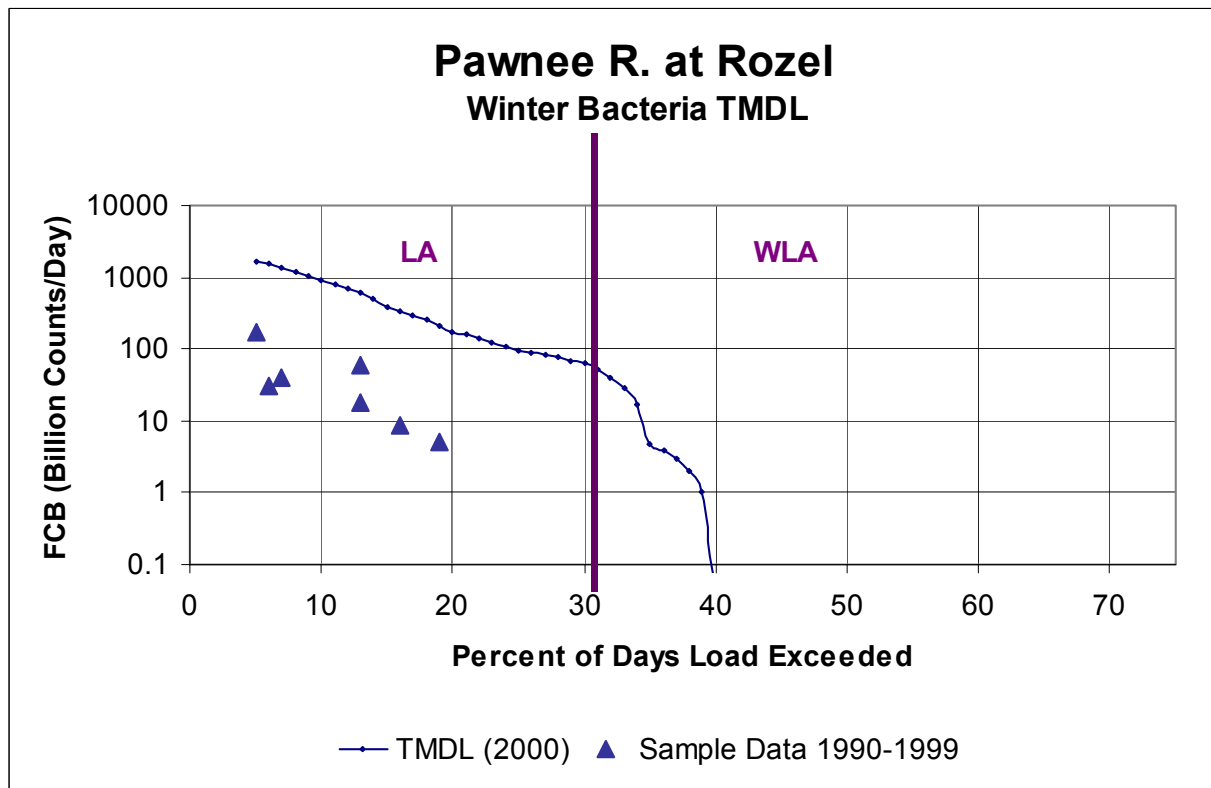


Figure 4

Excursions were seen in two of the three defined seasons. Twenty percent of Spring samples and 33% of Summer-Fall samples were over the secondary contact criterion. None of Winter samples were over the secondary criterion. Overall, 18% of the samples were over the criteria. This would represent a baseline condition of partial support of the impaired designated use.

NUMBER OF SAMPLES OVER BACTERIA STANDARD OF 2000 BY FLOW AND SEASON

Station	Season	0 to 10%	10 to 25%	25 to 50%	50 to 75%	75 to 90%	90 to 100%	Cum Freq.
Burdett (586)	Spring	1	1	0	1	0	0	3/15 = 20%
	Summer	1	1	1	0	0	0	3/9 = 33%
	Winter	0	0	0	0	0	0	0/7 = 0%

Desired Endpoints of Water Quality (Implied Load Capacity) at Site 586 over 2005 - 2009:

The ultimate endpoint for this TMDL will be to achieve Kansas Water Quality Standards fully supporting Secondary Contact Recreation. The endpoint will be to achieve the Secondary Contact Recreation value of 2,000 colonies per 100 ml and this load curve is shown in the TMDL figure. The Kansas Standards allow for excursions above these criteria when the stream flow exceeds flow that is surpassed 10% of the time, for this instance, 38 cfs. Monitoring data plotting below the TMDL curve will indicate attainment of the water quality standards.

This endpoint will be reached as a result of expected, though unspecified, reductions in loading from the various sources in the watershed resulting from implementation of corrective actions and Best Management Practices, as directed by this TMDL. Achievement of the endpoint indicates loads are within the loading capacity of the stream, water quality standards are attained and full support of the designated uses of the stream has been restored.

3. SOURCE INVENTORY AND ASSESSMENT

NPDES: There are two NPDES permitted municipal wastewater discharger within the watershed (**Figure 5**).

MUNICIPALITY	STREAM REACH	SEGMENT	DESIGN FLOW	TYPE
Hanston	Buckner Cr	2	0.04 mgd	Mech.
Jetmore	Buckner Cr	2	0.15 mgd	Mech.

Population projections for Jetmore to the year 2020 indicate slight growth (9% increase from 1990). Projections for Hanston indicate modest declines. Projections of future water use and

resulting wastewater appear to be within design flows for the current system's treatment capacity. The excursions from the water quality standards appear to occur under all flow conditions but particularly under runoff or higher flow conditions. Of significance to point sources are the excursions under low flow in all seasons, especially during winter, indicating that point sources may have an impact under lower flows in the watershed.

Livestock Waste Management Systems: Fifty seven operations are registered, certified or permitted within the watershed (**Figure 5**). Twenty two facilities are located within a mile of the main stem. With the exception of 5 dairy, 3 swine and one truck wash, all these operations are beef. Potential animal units for facilities within one mile of the main stem total 45,762. Potential animal units for all facilities in the watershed total 267,903. The actual number of animal units on site is variable, but typically less than potential numbers.

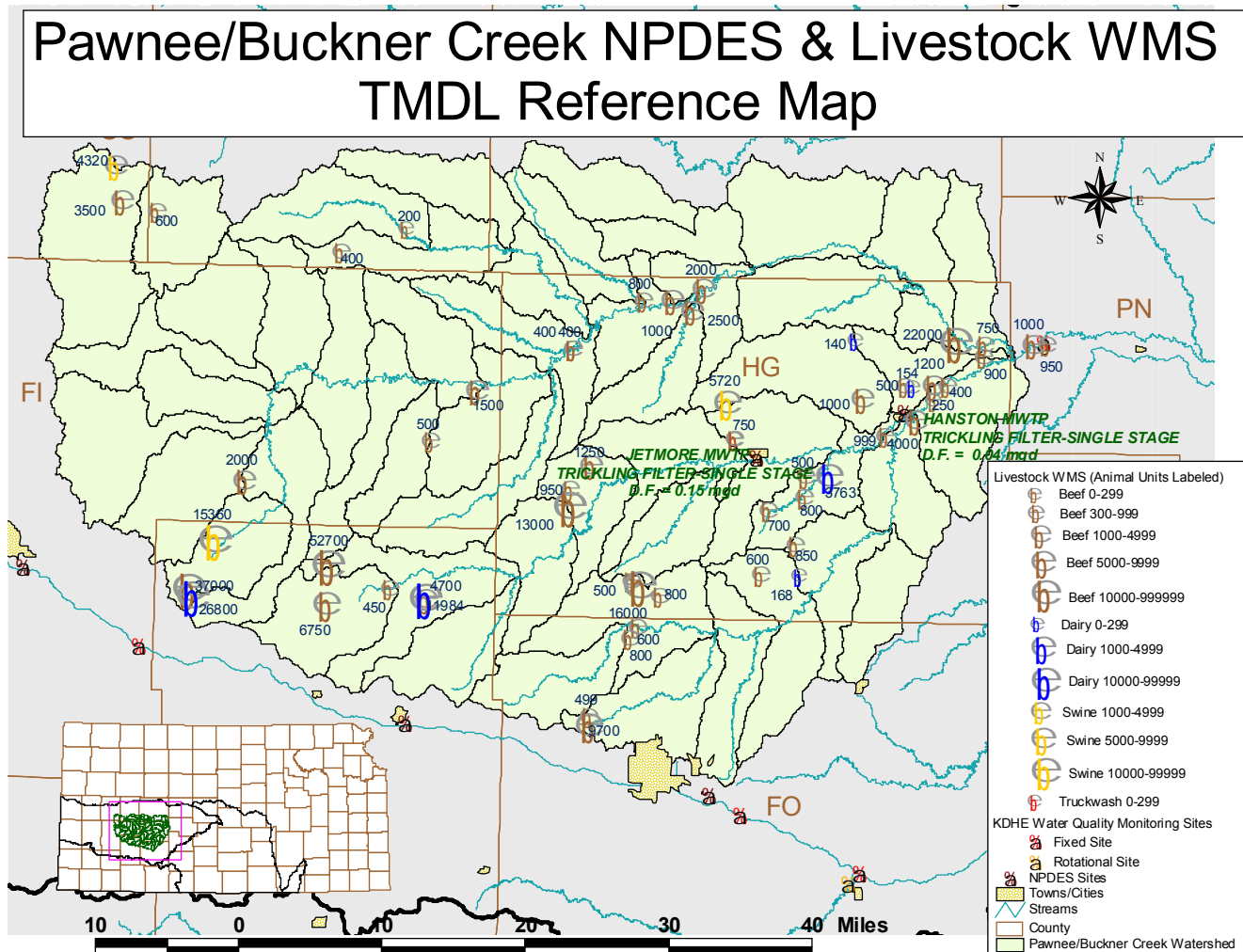


Figure 5

Land Use: Most of the watershed is cropland (70% of the area) and grassland (29% of the area) (**Figure 6**). The off-season grazing density of livestock is high for the Upper Arkansas River Basin along the impaired stream segments, while densities are lower elsewhere in the watershed. About half of the watershed's growing season grazing density is average for those HUC14s primarily along impaired stream segments, while the other half is comparably low. The grassland is mainly located on the steeper slopes in the alluvial valleys. Based on 1997 water use reports, approximately 9% of the cropland in the watershed is irrigated. Most irrigation occurs within the main stem valley and the upstream edges of the watershed.

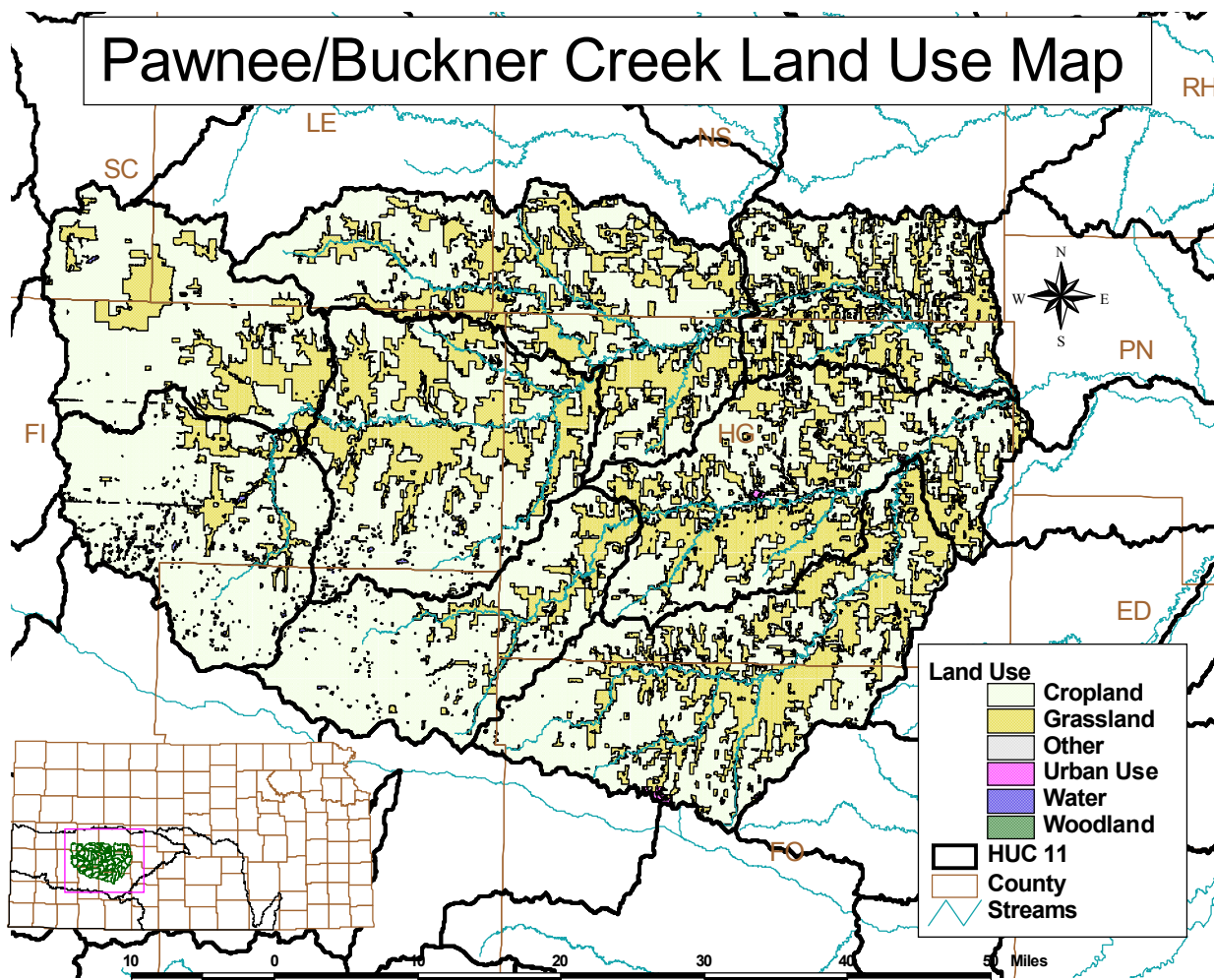


Figure 6

On-Site Waste Systems: Most of the watershed's population density is very low, 1 - 10 persons/mi², except for areas associated with towns/cities. The rural population projections for Hodgeman and Ford Counties through 2020 show moderate increases. All other counties associated with the watershed indicate moderate rural population declines. While failing on-site

waste systems can contribute bacteria loadings, their impact on the impaired segments is very limited, given the size of the rural population and magnitude of other sources in the watershed.

Contributing Runoff: The Pawnee River and Buckner Creek watershed's average soil permeability is 1.1 inches/hour according to NRCS STATSGO data base. About 99% and 93% Pawnee River and Buckner Creek watershed, respectively, produces runoff even under relatively low (1.5"/hr) potential runoff conditions. Under very low (<1"/hr) potential conditions, this potential contributing area is greatly reduced (35 and 20%, respectively). Runoff is chiefly generated as infiltration excess with rainfall intensities greater than soil permeabilities. As the watersheds' soil profiles become saturated, excess overland flow is produced. Generally, storms producing less than 0.5"/hr of rain will generate runoff from only 4% of these watersheds, chiefly along the stream channels.

Background Levels: Some fecal bacteria counts may be associated with environmental background levels, including contributions from wildlife, but it is likely that the density of animals such as deer is fairly dispersed across the watershed resulting in minimal loading to the river below the levels necessary to violate the water quality standards.

4. ALLOCATION OF POLLUTION REDUCTION RESPONSIBILITY

The nature of bacteria loading is too dynamic to assign fixed allocations for wasteloads and non-point loads. Instead, allocation decisions will be made which reflect the expected reduction of bacteria loading under defined flow conditions. These flow conditions will be defined by the presumed ability of point or non-point sources to be the dominant influence on stream water quality. Therefore, the allocation of wasteloads and loads will be made by demarcating the seasonal TMDL curves at a particular flow duration level. Flows lower than that designated flow will represent conditions which are the responsibility of point sources to maintain water quality standards, those flows greater than the designated flow are the responsibility of non-point sources.

Point Sources: The point sources are responsible for maintaining their systems in proper working condition and appropriate detention volume to handle anticipated wasteloads of their respective populations. Both municipal point sources rely on single stage trickling filter treatment system for their wastewater. The NPDES permits for these facilities have been reissued with schedules of compliance to reduce bacteria in the effluent. Ongoing inspections and monitoring of this system will be made to ensure that minimal contributions have been made by these sources.

Since the 7Q10 flow (1 cfs) condition is generally exceeded about 40% of the time, the Wasteload Allocation is defined as the flow regime between the 7Q10 and 100% exceedence. For Burdett, such flows would be exceeded 55-100% of the time in Spring, 35-100% of the time in Summer and 31-100% of the time in Winter. Future NPDES and state permits will be conditioned such that discharges from permitted facilities will not cause violations of the applicable bacteria criteria at these low flows.

Non-Point Sources: Based on the assessment of sources, the distribution of excursions from water quality standards and the relationship of those excursions to runoff conditions, non-point sources are seen as a significant cause of water quality violations. Background levels are not significant as a cause of the problem. Implementation of non-point source pollution control practices should be taken within one mile of the listed stream segments.

Activities to reduce fecal pollution should be directed toward the smaller, unpermitted livestock operations and rural homesteads and farmsteads along the river. The Load Allocation assigns responsibility for maintaining water quality below the TMDL curve over flow conditions exceeding the 7Q10 flow of 1 cfs. Best Management Practices will be directed toward those activities such that there will be minimal violation of the applicable bacteria criteria at higher flows.

Defined Margin of Safety: Because there will not be a traditional load allocation made for fecal bacteria, the margin of safety will be framed around the desired endpoints of the applicable water quality standards. Therefore, evaluation of achieving the endpoints should use values set 100 counts less than the applicable criteria (1,900 colonies for secondary contact recreation) to mark full support of the recreation designated use of the streams in this watershed. By this definition, the margin of safety is 100 colonies per 100 ml and would be represented by a parallel line lying below each seasonal TMDL curve by a distance corresponding to loads associated with 100 colonies per 100 ml.

State Water Plan Implementation Priority: Because Buckner Creek and the Pawnee River are major tributaries to the Upper Arkansas River, this TMDL will be a High Priority for implementation.

Unified Watershed Assessment Priority Ranking: A portion of this watershed lies within Buckner Creek (11030006) subbasin with a priority of 28 (Medium Priority for restoration work).

Priority HUC 11s and Stream Segments: Until additional assessment is done on the main stem reaches between 2000-2005, priority focus of implementation prior to 2005 will concentrate on installing best management practices adjacent to the listed stream segments.

5. IMPLEMENTATION

Desired Implementation Activities

1. Renew state and federal permits and inspect permitted facilities for permit compliance
2. Install proper manure and livestock waste storage
3. Install grass buffer strips along tributaries.
4. Install pasture management practices, including proper stock density on grasslands
5. Remove winter feeding sites in proximity to streams
6. Reduce livestock use of riparian areas
7. Insure proper on-site waste system operations in proximity to main streams.

Implementation Programs Guidance

NPDES and State Permits - KDHE

- a. Municipal permits for facilities in the watershed will be renewed after 2002 with continuation bacteria monitoring and permit limits preventing excursions in bacteria criteria.
- b. Livestock permitted facilities will be inspected for integrity of applied pollution prevention technologies.
- c. Registered livestock facilities with less than 300 animal units will apply pollution prevention technologies.
- d. Manure management plans will be implemented.

Non-Point Source Pollution Technical Assistance - KDHE

- a. Support Section 319 demonstration projects for pollution reduction from livestock operations in watershed.
- b. Provide technical assistance on practices geared to small livestock operations which minimize impact to stream resources.
- c. Guide federal programs such as the Environmental Quality Improvement Program, which are dedicated to priority subbasins through the Unified Watershed Assessment, to priority watersheds and stream segments within those subbasins identified by this TMDL.

Water Resource Cost Share & Non-Point Source Pollution Control Programs - SCC

- a. Develop improved grazing management plans
- b. Install livestock waste management systems for manure storage
- c. Implement manure management plans
- d. Install replacement on-site waste systems
- e. Coordinate with USDA/NRCS Environmental Quality Improvement Program in providing educational, technical and financial assistance to agricultural producers.

Riparian Protection Program - SCC

- a. Design winter feeding areas away from streams
- b. Develop riparian restoration projects

Buffer Initiative Program - SCC

- a. Install grass buffer strips near streams.
- b. Leverage Conservation Reserve Enhancement Program to hold riparian land out of production.

Extension Outreach and Technical Assistance - Kansas State University

- a. Educate livestock producers on riparian and waste management techniques.
- b. Provide technical assistance on livestock waste management design.
- c. Continue Section 319 demonstration projects on livestock management.

Agricultural Outreach - KDA

- a. Provide information on livestock management to commodity advocacy groups.
- b. Support Kansas State outreach efforts.

Local Environmental Protection Program - KDHE

- a. Inspect on-site waste systems within one mile of main tributary streams.

Timeframe for Implementation: Pollution reduction practices should be installed within the priority subwatersheds over the years 2001-2005, with follow up implementation thereafter.

Targeted Participants: Primary participants for implementation will be small livestock producers operating without need of permits within the priority watershed. Implemented activities should be targeted at those areas with greatest potential to impact the stream. Nominally, this would be activities located within one mile of the streams including:

1. Facilities without water quality controls
2. Unpermitted permanent feeding/holding areas
3. Sites where drainage runs through or adjacent livestock areas
4. Sites where livestock have full access to contributing tributaries and stream is primary water supply
5. Grazed acreage, overstocked acreage and acreage with poor range condition
6. Poor riparian sites
7. Near stream feeding sites
8. Failing on-site waste systems

Some inventory of local needs should be conducted in 2001 to identify such activities. Such an inventory would be done by local program managers with appropriate assistance by commodity representatives and state program staff in order to direct state assistance programs to the principal activities influencing the quality of the streams in the watershed during the implementation period of this TMDL.

Milestone for 2005: The year 2005 marks the mid-point of the ten year implementation window for the watershed. At that point in time, milestones should be reached which will have at least two-thirds of the landowners responsible for the facilities and sites cited in the local assessment participating in the implementation programs provided by the state. Additionally, sampled data from the seven monitoring stations should indicate evidence of reduced bacteria levels at median conditions relative to the conditions seen over 1987-1999.

Delivery Agents: The primary delivery agents for program participation will be the conservation districts for programs of the State Conservation Commission and the Natural Resources Conservation Service. Producer outreach and awareness will be delivered by Kansas State Extension and agricultural interest groups such as Kansas Farm Bureau or Kansas Livestock Association, the Kansas Pork Producers Council and the Kansas Dairy Association. On-site waste system inspections will be performed by Local Environmental Protection Program personnel for Sedgwick, Harvey and Reno counties.

Reasonable Assurances:

Authorities: The following authorities may be used to direct activities in the watershed to reduce pollution.

1. K.S.A. 65-164 and 165 empowers the Secretary of KDHE to regulate the discharge of sewage into the waters of the state.
2. K.S.A. 65-171d empowers the Secretary of KDHE to prevent water pollution and to protect the beneficial uses of the waters of the state through required treatment of sewage and established water quality standards and to require permits by persons having a potential to discharge pollutants into the waters of the state.
3. K.A.R. 28-16-69 to -71 implements water quality protection by KDHE through the establishment and administration of critical water quality management areas on a watershed basis.
4. K.S.A. 2-1915 empowers the State Conservation Commission to develop programs to assist the protection, conservation and management of soil and water resources in the state, including riparian areas.
5. K.S.A. 75-5657 empowers the State Conservation Commission to provide financial assistance for local project work plans developed to control non-point source pollution.
6. K.S.A. 82a-901, *et seq.* empowers the Kansas Water Office to develop a state water plan directing the protection and maintenance of surface water quality for the waters of the state.
7. K.S.A. 82a-951 creates the State Water Plan Fund to finance the implementation of the *Kansas Water Plan*.
8. The *Kansas Water Plan* and the Upper Arkansas Basin Plan provide the guidance to state agencies to coordinate programs intent on protecting water quality and to target those programs to geographic areas of the state for high priority in implementation.

Funding: The State Water Plan Fund, annually generates \$16-18 million and is the primary funding mechanism for implementing water quality protection and pollution reduction activities in the state through the *Kansas Water Plan*. The state water planning process, overseen by the Kansas Water Office, coordinates and directs programs and funding toward watersheds and water resources of highest priority. Typically, the state allocates at least 50% of the fund to programs supporting water quality protection. This watershed and its TMDL is a High Priority consideration.

Effectiveness: Non-point source controls for livestock waste have been shown to be effective in reducing pollution in locales such as the Herrington Lake watershed.. The key to effectiveness is

participation within a finite subwatershed to direct resources to the activities influencing water quality. The milestones established under this TMDL are intended to gauge the level of participation in those programs implementing this TMDL.

Should voluntary participation significantly lag below expectations over the next five years or monitoring indicates lack of progress in improving water quality conditions from those seen over 1987-1999, the state may employ more stringent regulations on non-point sources in the watershed in order to meet the desired endpoints expressed in this TMDL. The state has the authority to impose conditions on activities with a significant potential to pollute the waters of the state under K.S.A. 65-171. If overall water quality conditions in the watershed deteriorate, a Critical Water Quality Management Area may be proposed for the watershed, in response.

6. MONITORING

KDHE will continue to collect bimonthly samples at Station 586, including fecal coliform samples over each of the three defined seasons. During the evaluation period (2005-2009), more intensive sampling will need to be conducted under specified seasonal flow conditions in order to determine the achievement of the endpoint of this TMDL. The manner of evaluation will be consistent with the assessment protocols used to establish the case for impairment in these streams. Following current (1998) Kansas assessment protocols, monitoring will ascertain if less than 10% of samples exceed the applicable criterion at flows under 38 cfs with no samples exceeding the criterion at flows under 23 cfs. Use of the real time flow data available at the Rozel stream gaging station can direct sampling efforts.

USGS should complete analysis of SSURGO soil data and 30-m resolution DEM topographic data to evaluate the relative runoff contributing areas within the watershed and provide greater resolution on where implementation activities would be most effective. This analysis should be complete in 2000.

Monitoring of bacteria levels in effluent will be a condition of NPDES and state permits for facilities. This monitoring will continually assess the functionality of the systems in reducing bacteria levels in the effluent released to the streams.

Local program management needs to identify its targeted participants of state assistance programs for implementing this TMDL. This information should be collected in 2000 in order to support appropriate implementation projects.

7. FEEDBACK

Public Meetings: Public meetings to discuss TMDLs in the Upper Arkansas Basin were held March 8 and April 24 in Garden City and April 25 in Great Bend. An active Internet Web site was established at <http://www.kdhe.state.ks.us/tmdl/> to convey information to the public on the general establishment of TMDLs and specific TMDLs for the Upper Arkansas Basin.

Public Hearing: A Public Hearing on the TMDLs of the Upper Arkansas Basin will be held in Garden City on May 31, 2000.

Basin Advisory Committee: The Upper Arkansas Basin Advisory Committee met to discuss the TMDLs in the basin on October 6, 1999; January 11 and 24, 2000; March 8, 2000;

Discussion with Interest Groups: Meetings to discuss TMDLs with interest groups include:
Associated Ditches of Kansas: October 6, 1999; January 28, 2000; March 8, 2000; and April 24, 2000.
Agriculture: February 28, 2000
Environmental: March 9, 2000

Milestone Evaluation: In 2005, evaluation will be made as to the degree of impairment which has occurred within the watershed and current condition of the listed stream segments. Subsequent decisions will be made regarding implementation approach and follow up on additional implementation in subwatersheds.

Consideration for 303(d) Delisting: This watershed will be evaluated for delisting under Section 303(d), based on the monitoring data over the period 2005-2009. Therefore, the decision for delisting will come about in the preparation of the 2010 303(d) list. Should modifications be made to applicable criterion during the ten year implementation period, consideration for delisting, desired endpoints of this TMDL and implementation activities may be adjusted accordingly.

For this TMDL, assessment for delisting will evaluate if the percent of samples over the applicable secondary contact recreation criterion is less than 10% for samples taken at flows below the high flow exclusion over the monitoring period of 2005-2009. This assessment defines full support of the designated use under water quality standards as measured and determined by current Kansas Water Quality Assessment protocols. These assessment protocols are similar to those used to cite the stream segments in this watershed as impaired on the Kansas 1998 Section 303(d) list. As protocols and assessments for impairment change for future 303(d) lists, the monitoring data collected under this TMDL will use these new assessments and protocols for delisting consideration.

Incorporation into Continuing Planning Process, Water Quality Management Plan and the Kansas Water Planning Process: Under the current version of the Continuing Planning Process, the next anticipated revision will come in 2002 which will emphasize revision of the Water Quality Management Plan. At that time, incorporation of this TMDL will be made into both documents. Recommendations of this TMDL will be considered in *Kansas Water Plan* implementation decisions under the State Water Planning Process during Fiscal Years 2001-2005.

Approved August 9, 2000